AI1110 Assignment I (ICSE Class 10 2019)

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Question 2(b): prove that
$(\csc\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$=1
solution: Given that in the equation, RHS=1.
we have to show LHS = RHS , i.e 1.
LHS =$(\csc\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta)$
we know that,

$$\csc\theta = \frac{1}{\sin\theta} \tag{1}$$

$$\sec\theta = \frac{1}{\cos\theta} \tag{2}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{1}{\tan\theta} \tag{3}$$

$$\sin^2\theta + \cos^2\theta = 1 \tag{4}$$

from eqns (1),(2),(3),(4) we get,

$$LHS = \left(\frac{1}{\sin\theta} - \sin\theta\right)\left(\frac{1}{\cos\theta} - \cos\theta\right)\left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right) \tag{5}$$

$$LHS = \left(\frac{1-\sin^2\theta}{\sin\theta}\right)\left(\frac{1-\cos^2\theta}{\cos\theta}\right)\left(\frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta}\right) \tag{6}$$

$$LHS = \left(\frac{\cos^2\theta}{\sin\theta}\right)\left(\frac{\sin^2\theta}{\cos\theta}\right)\left(\frac{1}{\sin\theta\cos\theta}\right) \tag{7}$$

$$LHS = \left(\frac{\sin^2\theta\cos^2\theta}{\sin^2\theta\cos^2\theta}\right) \tag{8}$$

$$LHS = 1 = RHS \tag{9}$$

$$\boxed{\therefore LHS = RHS}$$

hence proved that,

$$(\csc\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1 \tag{10}$$